IAQ Tools for Schools Webinar Transcription – The Virtual School Walkthrough: Identifying and Solving Common IAQ Problems

December 9, 2011

Jennifer Lemon: Welcome everybody! Thank you for taking the time to attend this very informative webinar today. In this hour and a half or so, you will hear strategies for performing a comprehensive walkthrough and then how to use that information collected to advance your IAQ management program.

My name is Jennifer Lemon and I work in the Indoor Environments Division for the Environmental Protection Agency, more specifically supporting the *Indoor Air Quality (IAQ) Tools for Schools* program.

Shortly you will hear from two speakers, Dave Blake and Rich Prill, who have presented numerous times at our various events, and they have a great depth of knowledge about this topic. They have conducted hundreds of walkthroughs in schools, so I have a feeling you're definitely going to learn a great deal of information from this webinar you are attending.

Jennifer Lemon: Let's go ahead and get started with today's webinar. We're recording this presentation so you can refer back to this information at a later date and share it with your colleagues. We hope by Monday to have a PDF of the slide available online for you to download, and also at a later time we will have the audio and the presentation sync, so you can use it like you were here and also share that again with your colleagues. View EPA's IAQ Tools for Schools online resources from the webinar at this link: http://www.epa.gov/iaq/schools/webconferences.html.

The first website listed will be the location where you can review and download this presentation as well as other past technical webinars that we have conducted. Also the next website is a place where Dave and Rich have some additional presentations and a video that can walk you through the school walkthrough process. It's a really great resource and I recommend you check it out when you have a chance. Visit the Northwest Clean Air Agency's website at the following link:

http://www.nwcleanair.org/aqPrograms/indoorAir.htm to view the entire video of The Virtual Schools Walkthrough: Identifying and Solving Common Indoor Air Quality Programs.

Let's go ahead and get started with our first polling question. We'd like to get an idea of the types of people that are on this presentation, so let me go ahead and open the poll.

If you could, we'd like to see what is your role in performing a school walkthrough? Go ahead and click the answer that best is appropriate for you. If you are an "other", if you could please use the chat function and write what your position is if it falls into the other category.

So we'll keep the poll open for about 30 more seconds – looks like most of you have voted. OK, great, we're going to go ahead and close the poll and share the results with you.

OK, great. So it looks like we do have a majority of school personnel and I know that runs a gamut. Or probably it could be a teacher or a custodian, school official, principal so we were trying to keep it – it's hard to put that many different types of school personnel, so I hope this captures what that title would be.

And it's great to see that we have some technical people on it as well, and then 22 percent of others, so I'll be curious to see where the others fall in, to see what types of individuals are involved in the walkthrough. But all these types of people are part of an IAQ management team, and all these professions and then types of people would be involved in advocating for school IAQ management and sustaining an IAQ program in a school.

So next slide we're going to have another poll. Again please vote with the most appropriate answer, "What is the experience that you have with the IAQ tools for schools guidance and action kit?"

Great, it looks like the results are pretty close together. We will give it about 20 more seconds. OK, great, we're closing the poll now and sharing the

results. Wonderful, OK, so it looks like we do have a good mix of people that have heard of the kit and very close to – wow, none.

So we do have some newbies on here, so keep that in mind, Dave and Rich, as you're making the presentation. Twenty-nine percent of these people on currently are not familiar with the Tools for Schools program guidance. So this is really a great opportunity for you guys to really learn a lot about the starting.

So for those of you who maybe not know about the kit, this is a picture of the Tools for Schools Kit and what we consider to be the cornerstone – one of the cornerstones of our program. I'll take a few minutes to sort of go over some program elements, how we got started and just talk a little bit about the framework we've designed to help schools manage their indoor environment.

Then I'll turn it over to Dave and Rich to really get into the nuts and bolts of performing a walkthrough.

So the program began in 1995 with the release of the Tools for Schools Action Kit and it's been involving resource that continues to be a strong foundational element of the program. It provides best practices, walkthrough check list, industry guidelines, simple policies and simple IAQ management plans to help schools and school districts take immediate action to implement effective IAQ management plans. View EPA's IAQ Tools for Schools Action Kit at the following link: http://www.epa.gov/iaq/schools/actionkit.html.

The Tools for Schools program has been implemented successfully in tens of thousands of schools nationwide and we have learned a lot at EPA of what it takes to create IAQ programs that deliver remarkable health environmental results that schools are seeking.

So EPA organizes this knowledge into a framework of proven solutions and the framework is called Framework for Effective School IAQ Management. It provides a common language to describe the drivers of IAQ management success. It offers details, guidance on proven strategies, organizational purchase, leadership styles that are fundamental to program effectiveness.

It presents a clear vision of the pathway to school IAQ excellence. We really look at these as something that – as reflected that you will do continuously. It's a highly flexible and adaptable structure allows any school, regardless of its location, size, budget, or condition to use the framework to launch reinvigorate or sustain effective IAQ management program. View EPA's Framework for Effective School IAQ Management at the following link: http://www.epa.gov/iaq/schools/excellence.html.

So here are a few of the – how we continuously assess using this cycle and these are the six key drivers for effective school IAQ management. As you can see, we start with assessment then go to planning, action, evaluation and these all work together to deliver effective school IAQ management programs.

But they can also be applied to other management systems within a school district as well. The key drivers are as follows: you organize your program; communicate with everyone all the time as often as possible; assess your school environment and how occupants are doing continuously; plan your short and long term actions based on your assessments and other important factors; act to solve and prevent IAQ problems and address structural, institutional behavior issues; and evaluate your results and the impact of your program for continuous involvement.

Now for the six Technical Solutions that define most of the common issues that schools need to address to effectively manage IAQ risks, which address systematically and aggressively an IAQ management program that focus on the six Technical Solutions, will deliver a healthier school environment.

Now please don't let this slide scare you, I know it's a lot of information but this will really be at the heart of what Dave and Rich are about to talk about. These solutions really are what we see are the main six Technical Solutions that feed into the framework. Again, we will have these slides available after this presentation so this is really great information that you can share with your colleagues and really help you move forward with developing a program.

To ensure the quality and section operation in the management and maintenance of your HVAC systems, we want you to be active and aggressive

with addressing and controlling moisture and mold, and want you to have a strong integrated pest management program. We want you to have effective consistent cleaning and maintenance activities and smart and low-emitting, low-toxicity materials selection.

Lastly, aggressive source control for example through anti-idling school bus policies, radon testing, or proactively managing your school's of chemical inventory. Learn more about EPA's IAQ Tools for Schools Technical Solutions at the following link: http://www.epa.gov/iaq/schools/technicalsolutions.html.

OK. Lastly before we get started, we're going to open one more polling question – two more. So "How often are you conducting school walkthroughs in your building?" Now don't be shy, we won't be sharing this with anybody, we're not here to judge, that's why this is anonymous, but hopefully after you hear this presentation, this will motivate or help you offer these on a more continuous basis.

So it looks like the majority of you are doing them on an as needed basis so I hope that isn't related to a possible crisis or a need, but again, I guess the important thing to note is that you're doing them.

So we have 17 percent monthly; 10 percent quarterly; and 30 percent annually. So the good news is that a majority of you are actually doing them. Hopefully this 22 percent that's not conducting walkthroughs after you hear this presentation that number will certainly go down.

So we have one more poll? Great. "What are the biggest IAQ issues about your school bases?" And granted we didn't have enough room to include all of them. So these are just the basics that we hear from most of our stakeholders that are the biggest issues and again feed into our Technical Solutions.

OK, great, it's looking like HVAC seems to be the biggest issue with a very close second as mold and moisture.

Well thank you for participating in our polls, this is very helpful information as we get started and so Dave and Rich can kind of see what kind of audience they're working with. I'm going to go ahead and pass it on to Dave Blake, who is going to take the reins first in getting you through the process of conducting a school IAQ walkthrough. Go ahead, Dave.

Dave Blake: Thank you Jen and EPA for putting on this webinar for us today.

OK, so I'm Dave Blake and I'm here with my friend Rich Prill and I'm going to get started today and just talk about our philosophy and pour into to how and why we do walkthroughs. I'm going to pass the torch to Rich who's going to actually do the virtual walkthrough for us.

And this virtual walkthrough is hundreds of slides taken from the 1,000 schools and 25,000 classrooms that Rich has been through the last 10 to 15 years and just give you good examples of what we encountered in schools. Then before Rich gets into this virtual walkthrough, he's going to take time to explain the two very important concepts that we need to understand before we do walkthroughs, kind of the way we do them.

One is carbon dioxide diagnostics to assure the atmosphere of fresh outdoor air ventilation in school, CO2 diagnostics. And the second is the critical importance of the direction of air flow throughout the school. And when Rich gets into that you'll see what I'm talking about, so I'm going to go ahead.

So why do we do walkthroughs? To reduce exposures and improve indoor air quality through onsite discussions, talking our way through the school, talking with the people, seeing what there is to see and taking appropriate measurements, different parameters that we'll discuss.

You've been explained the framework and of course where we sit is over here in the assessment, that's basically where the walkthrough fits into the process here. But the walkthrough is an essential step to building and adopting an effective indoor air quality program for your school. Here is a pro tip for you: schools are dynamic; things are going to change. Monitoring is your early warning system. You want to find problems before they find you.

We would like to use this routine health check up analogy. It's all about prevention, when we look at a school it's really similar to the way the doc's going to look at you when you go in for your physical. You go in because you don't know what you don't know.

The doctor, when he takes a look at your body, he's going to check basics parameters. If something weird or exotic seems to be going on, the doc can call in a specialist, it's a great opportunity to talk things over with your doc just like when we go into schools, we're looking for basic parameters.

And if we see something weird or exotic going on in the school, we can actually refer to a specialist in that particular field and it's a great opportunity, as we say, to talk our way through the school's personnel and staff.

What gets measured gets controlled or fixed on your body, just like when we look at the school and find something that needs a fix. If we don't look, we don't know, and if we don't find it, we can't fix it. We try to establish a baseline for the school of how it's ticking away today, on a typical day, just the way the doc tries to establish a baseline for your body – how you're doing today.

That gives you something to compare to down the road. We also like the immediate feedback you get from a physical – hopefully reducing anxiety and providing peace of mind that you're doing well – and the same way that we hope the results of what we find in a school walkthrough provides a peace of mind about what was a source of anxiety for staff, and lets them know that the school is humming along the way it supposed to.

When to get buy-in from the administration? Before you do a walkthrough work or after, but the thing is sometimes you can run up almost against a brick wall with some personalities that you run into. And so if you don't get buy in right away, you need to sell, but sell gently – there is an incredible need for patience because we're all learning about this stuff at the same time and, you know, administrators weren't born air quality experts. So patience is very, very important. Sell gently and realistically and don't burn any bridges and

your talking points. View EPA's IAQ Tools for Schools Key Drivers at the following link: http://www.epa.gov/iaq/schools/starting.html.

Walkthroughs are non-threatening; they're non regulatory; we have no rules to enforce indoors. It sends a positive message to staff and parents. We didn't force our way into the school, you invited us: "Please come, take a look at our school, and tell us what we can do better."

It's a practical learning opportunity, a one-on-one skills training for your maintenance and custodial staff. At the end of the day, we typically have to pry the instruments out of the hands of these people because the dirty little secret is: this is fun.

Our goal of course though this awareness and program development, is that school staff will understand indoor air quality essentials better. They will understand their buildings better and develop the confidence and the skills that it takes to sustain an effort down the road.

Our walkthroughs last typically half-to-three quarters of the school day for your typical 20-classroom school. It's an opportunity to establish credibility with the people that you're walking through the school: show what you know, show that you care, show that you know how to listen.

A walkthrough team typically will need to include a facilities director or head custodian, somebody with the keys; it's nice to have the principal along, at least for a few classrooms, so they can observe the routine classroom-by-classroom. And they're only spending, you know, five minutes or so in a classroom unless we see something odd, just to see that normal routine that we're running through.

You want to keep the team small if you can, but more can join. Other people that might be interested will be a nurse, HVAC technicians, representatives even from other school districts if there is room or health departments that are out of county, if they need training and you have room on your team. But you know, the team can get a little big, but it doesn't mean that everybody has to go into every classroom, but just be aware of size and disrupting the class.

Before you start on the walkthrough – and we'll get there early in the morning, 8.00 or 8.30 – you want to have a sit down with the principal and the walkthrough team to come to an understanding about what we're there for.

First of all, we want to agree that at the end of the day we're going to post results of numbers that we collect during the day. We're going to post them in the staff room like an open book with the business cards of people that can explain what those results mean, so there are no misunderstandings.

We want to agree that this walkthrough is a first step to building an indoor air quality program and that if we find anything that is really dangerous, appropriate action is going to be taken in a logical timeline.

We want to visit a fully occupied school with normal activities going on. We need the occupants and their carbon dioxide from their breath to do our CO2 diagnostics, and it gives us a more realistic picture of how that school is operating along on a baseline that day.

Always, you want to have advanced notice that we're coming, so that we don't have to explain ourselves classroom-by-classroom, and also so that people know we're here proactively and not in response to a crisis. When you get to an individual classroom it's good, we think, if they have a local team member going first, especially with smaller kids so that we're not going in, barging in and freaking the little kids out with all of our ghost buster equipment hanging on us.

You often get the question, "What are you up to?" And we typically like to say, "Yes, we're trying to ensure that you're getting plenty of fresh air in here." Or "Your teacher wants to make sure you're getting plenty of fresh air," or "Your administrator wants to make sure you're getting plenty of fresh air." As opposed to, "Your mom's attorney wants to make sure you're getting plenty of fresh air in here."

Teachers will ask us to stop and talk, explain what we are doing. That's always fun, you explain to the kids that you know this is science and this is fun.

A walkthrough provides an important baseline to shape content priorities of your indoor air quality program, an essential first step to practical and effective action – and I'm going to pass the baton to my partner Rich Prill.

Rich Prill: Thanks, Dave. Thanks everyone for attending. The thing to remember about a school walkthrough is it's not a science project. We're there just to look for good practices and the goal is to reduce exposures and to avoid expensive problems. We look at the buildings top-to- bottom, inside and out, and we're looking for five basic elements that I think cover most of everything that's in the tool kit.

These are your guiding principles: you want to make sure your building is dry, clean, comfortable; you control the pollutants that will create exposures; and we want to have adequate fresh air ventilation in the schools, and we want to observe those; and we also want to do measurements, common sense measurements to make sure we're meeting these parameters.

What gets measured gets fixed or controlled, and so with these practical measurements we gather some information that can lead to setting goals and to actually allow schools to get the resources they need to meet these goals. We want to measure only what we can reasonably interpret, we don't want a bunch of science data – we want to get useful information that leads to solutions and reduces the exposures.

The basic measurements we look for that will allow us to make sure the building is dry, clean and comfortable, ventilated and that pollutants are controlled are moisture, temperatures for comfort, and to avoid moisture problems, airflow direction, carbon dioxide or CO2, and also we want to measure for radon, lead, if that's a possibility, particles, carbon monoxide of course if you have combustion devices. So these are measurements that are pretty essential to making sure the building is running properly.

Another way to look at that is look for leaks – relative humidity with the measurement devices, particles will let us know if the building is clean or we are exposing people to too many irritating particles or possibly hazardous particles.

We look for comfort and we do that with temperature (sliding) and acoustic measurements. Pollutants can be radon, carbon monoxide and other potential hazards that we know are real risks and we can measure those pretty easily and we know what those numbers mean. We also measure carbon dioxide to look for adequate fresh air ventilation, we'll be talking about that in a little bit of detail here.

This is kind of what our walkthrough kit looks like, Dave mentioned we come to the school looking like ghost busters with this equipment hanging off us. But it'll fit in just a shoulder bag and is pretty easy to acquire this equipment, it's easily available.

What we look for is air flow direction. We use – typically a chemical smoke tube, costs about $50 – we measure temperatures with a simple temperature relative humidity gauges and those are available for about $100.

Ventilation: we measure CO2 or carbon dioxide and those meters run – probably a reasonable price for a low end one of those is about $500 – and we look for moisture and we use the moisture meters. They cost about $300 for a good one, and we can look at the materials and the moisture in the air.

If you have a little extra money to spend, it's nice to have a recording meter, which will allow you to get data day-in and day-out that lets you know what's going on when you can't be in that space and it gives us a lot of information in addition to the carbon dioxide, a lot of these meters have carbon monoxide, temperature relative humidity, so we can track essential elements over the course of the day or a week.

This slide gives you an idea of what a data recording meter will provide you. You can see on this elementary classroom where the students come in, the carbon dioxide builds up from breathing, then you can see about 9 o'clock they go to recess, then there you see the drop in CO2 for lunch hour, they come back in the room, the CO2 builds up in another recess, and then they go home.

So this allows us to see what's going on with the ventilation system throughout the day. And our target for classrooms is that they not exceed

about a 1,000 parts per a million of CO2. That's a rule of thumb, it's – that's good practice.

We also suggest maybe a better kit for larger school districts or more – gathering more and practical information would be a pressure gauge to look at the pressures in your contained zones and acoustic meter, light meters and the particle counter. So those will get a little bit more expensive, but those are essential tools for more technical folks.

And the deluxe kit would include a thermal imager, which you can see in this image here that you can see energy loss, you can see moisture, you can see other problems that you can't see with the naked eye or with other measurement devices. They also take pictures so those pictures are often times worth a 1,000 words when you're looking for resources or solutions.

We want to build relationships with the facilities people. We're not there to find fault with anybody's job, we don't want to threaten people and make them look like they've been falling down on the job, we are there to help them and leave skills behind so they can take over when we leave and keep that building clicking along just right.

We want to point out potential problems but we don't overreact. We don't want to be alarmist – again schools are dynamic, they are always changing and we just want to alert the staff and the school folks that they need to pay attention, it's always a work in progress, because as soon as you turn your back something could change.

It's not a problem unless it's a problem, so we don't want to overreact, to be alarmist and expect a perfect school. We rarely see a perfect school and even if it seems to be perfect, you know, what's going to happen tomorrow? These buildings are dynamic, mechanical equipments fail, things happen.

We want to practice prudent avoidance for exposure, so if we see something that looks like an exposure, definitely want to address that immediately. We use a walkthrough checklist from the Tools for Schools kit and we also like to promote checklist and data recording that doesn't suggest problems, it just says OK. And if there is an issue, we just write up the notes about it, we don't

want to be alarmist, we don't want to say "bad or poor or dangerous", we just say, "See the notes," and we explain what needs to happen. View EPA's IAQ Tools for Schools Walkthrough Inspection Checklist at the following link: http://www.epa.gov/iaq/schools/pdfs/kit/checklists/walkthruchklst.pdf.

We typically use a basic fire escape plan; we don't need blue prints, we want to keep this simple, basic, and very usable and practical. So we use a basic floor plan so we can make notes and we can find our way around the buildings and share that at the end of the day.

You can see that we focus on those areas with potential pollutants, art classrooms, kitchens, mechanical areas, science class, home ec, locker rooms, photo lab if they still have chemicals in there and we want to make sure those zones are not spreading pollutants, cross contaminations throughout the building, so we want to contain those – any pollutants in those zones and reduce any exposures.

Air should move from clean to dirty. Dave mentioned we are going to talk about pressure control and the idea is that we contain pollutants with pressures in the buildings. Air moves because it's pushed or pulled due to pressures, and so we want to look at our building and make sure the air is going from the history class room to the shops or from the library to the physics or biology lab.

We don't want air to go the wrong direction, and we control that with mechanical pressures. We want to look at our building in a sort of a global view, if you will, and make sure air is going through the building from the cleanest zone on down to the dirtiest zone, and then exhaust on the outside.

So take a look at your building floor plan and make sure the air is going from clean to dirty. We typically use this tracer smoke to track the air movement, and you can also use the pressure gauge, which is really valuable when you have zones that you absolutely want to be under control negative pressure routine. And you can write that number down so you have documentation.

If you've got a zone like this, it says, "Hazardous asbestos", don't enter without proper training. We want to make sure that air is always going from

the clean zone into the contaminated zone or zone with some contaminants. So a pressure gauge; sometimes is good to write that number down so you have documentation.

In this elementary school, we saw air coming out of this doorway into the hall and you can see that there could be a lot of anxiety from the parents, thinking their lovely child has been exposed to asbestos. So this is a critical zone that needs to be kept under negative pressure to ensure that there is no contamination.

Wood dust in the hallway suggests that the shop exhausts aren't working properly. Not the kind of thing we want to see, air coming out of a chemical store room. If you're not looking you don't know.

And so we draw arrows on the floor plan of what we find on a particular date and focus on those areas that we know have contamination in them to ensure that air is going the proper direction. This would be something you'd want to do on a very routine basis.

Adequate ventilation: we want to make sure we ventilate. It's a requirement in schools to provide fresh air and a lot of our schools have windows, so we would need to make sure that our mechanical systems are working properly to bring in that fresh filtered air. We look at fresh air for schools in terms of the cubic feet per minute or CFM of fresh air per person. So we sort of count heads in the classroom and try and get enough fresh air for those folks.

This is what 15 CFM or cubic feet per minute of fresh air will look like for each person, so 15 blocks of air per person per minute per classroom. We use carbon dioxide as an indicator to estimate the ventilation rate. And so as the students and teacher breathe in the classroom, that CO2 can build up. And if we're not ventilating that room, it will build up to unacceptable levels. So by using CO2, we sort of track the fresh air per person for those classrooms using CO2 as a good indicator.

The handy measurement device. Here is what the numbers mean: if you're providing the 15 cubic feet per minute per person in a classroom, the CO2 is going to go up to about a 1,000 parts per million, and that would be sort of the

maximum we want to see. If we're bringing in 20 CFM, you can see the CO2 will be lower, at 25 CFM: more fresh air. The CO2 only builds up to about 600.

So it's a good indicator of how much pressure you're bringing in, very essential measurements. As CO2 builds up, so does everything else, and we know that everything else is going to be too difficult to not only measure but to interpret. So CO2 is a good indicator that we're taking care of everything in the building at a reasonable level.

The CO2 provides good documentation so you know whether the system is working or not, if something has gone out of calibration or there's been some sort of a fault in the dampers or the mechanical system, it's really critical for your routine monitoring to make sure that something is working properly. It's an excellent public relations tool; the occupants really like these numbers and the feedback they get as they can actually see the fresh air coming in with the meter numbers.

Elevated CO2 may impact performance; there are some scientific studies and so forth that show that increased CO2 impacts performance in the classroom as well as attendance. So we want to keep fresh air in the building not only for health but for performance of the students and staff. These are sixth graders that were left behind because the CO2 was too elevated in their school, so we need to be careful that we bring in fresh air to keep people alert and healthy.

On our floor plan we would document rooms that are over 1,000 roughly, to make sure we increase the ventilation in those spaces. And we'd also look at rooms that are below, say about 500 of CO2 because those may be over ventilated, and that's going to cost us money in terms of energy when we've got cold or hot environments outdoors. So we can do energy efficiency at the same time we do comfort and fresh air.

While CO2 is building up we're going to be looking around the building. We don't want to measure CO2 first thing in the day; we want to let the people breathe in the room until 10.00 or 10.30 in the morning so we can get a good

reading with the CO2 device. So we start looking outside, walk around, look for any obvious indications of moisture entry or other entry into the building.

We can see that what's outside gets inside and what's inside builds up. So as we put people in these, essentially, boxes, the outside air brings contaminants in. Whatever we do inside is going to build up.

Look around at the neighborhood sources – if you have some pollutants in the neighborhood, we need to perhaps deal with those, make sure the filters are sufficient. We look to make sure we're tracking off soil and other contaminants that could be tracked into the buildings, so look at your landscaping, look for any water leaks. We look high, we look low, we look at where the air intakes are to make sure they are not obstructed or we've got pests that are living too near of our intakes.

Look for plants that might have some pollen or other things that could cause problems indoors. Look for openings where we can get rodents and insects and other pests into our building. Look for moisture, proper drainage – this water out in the yard is not a bad thing, but it could get in underneath the building or soak in through the foundation and cause problems under the concrete floors.

The bricks and blocks that we build our buildings out of, these masonry products, they are essentially rigid sponges so that water can soak right through the masonry and cause problems inside the wall cavities. We look to make sure the groundskeepers are not spraying water under the building that can then, of course, turn into mold indoors as it enters through those rigid sponges.

We look to other openings in the building, and you can see in this photo the down spouts seems to be clogged up, so we've got some potential entry into those wall cavities from the outdoors. So we'll mark that on our floor plan and then check that room indoors for any problems.

Some of our buildings are built into the ground and as we start looking through the building, we notice that there is some water entry from that

foundation, so it pays to keep your eyes open when you're outside and investigate those zones when you go indoors.

Obviously this roof is shedding snow, and the snow is going to sit against that wall, and when we go inside, we find that indeed the moisture has intruded into that wall cavity and now we've got some problems. So again, this is all about prevention, looking for potential problems and doing prevention.

Now look for anything that might be lead paint. Track your air intakes, make sure we're not contaminating the air as we bring it in. Here's the air intake next to the exhaust, so we get re-entrainment, plugged intakes, more plugged intakes, again this happens so we need to be – we need to monitor this on a routine basis to make sure that cotton wood trees and other outdoor pollutants don't obstruct our air intakes.

We'll go on the roof to see how things would look. We don't need to be experts on the roof, but we need to sort of ask questions about how these systems are running and try and learn something the mechanical systems. Here you can see the fresh air dampers are slammed shut: not a good situation. You don't know unless you go look.

We look for combustion products that might be brought into the building through air intakes. We inspect everywhere. So here is a mechanical room with a ladder – the ladder is basically an invitation to go up and look around in the attic, and you just never know what you're going find. This was an excessive amount of bat guano over a third grade classroom, not a good situation if that had caved in on the bunch of innocent students.

We look for moisture. We want to keep the moisture away from the mold food. Again, if the moisture gets in contact with the mold food, you're going to have a problem, so this may not be elegant but it keeps the water away from the mold food, so we need to put band-aids on things if we have to.

This is more containment of water leaks, you want to contain that water, not let it get close to carpeting or sheet rack and other mold food products. We looked under the building, and these are some unplanned pathways where air can move from, let's say, "dirty zones to clean zones." We look at the air flow

direction, and we know that warm air rises in our buildings so we need to look at these openings to make sure that we don't have contaminants entering from beneath the building through these unplanned pathways.

Pt's pretty obvious that that tunnel should be under a negative pressure or sealed up so we don't get close contaminants into the building. What we can do is look around for duct work that could be disconnected, other pathways that can cause problems in our buildings. So we look high, we look low.

This tunnel is the air duct for the school so we'd want to make sure this is clean and dry and not a contaminated zone that would impact the people at the other end of this air tunnel.

Again another air tunnel: you don't know unless you look. This tunnel actually had asbestos codings and it also had radon entry through the penetration, so we were delivering pollutants right to the people in the building. So it pays to look; we look inside, top to bottom.

We check our CO2 meters outside to make sure they have a reasonable calibration. It should be about 380 outside, that's about as fresh as you can get. So we check our meters outside and then we go inside after the people have breathed for a while and check those indoor spaces.

Now we want to stop the dirt at the door; the first thing is to catch the big chunks. We want to see about a three-stage walk-off, mat systems, so as we get about five or six good footsteps on these walk-off mats. It's important to realize that walk-off mats are just an added attraction to cleaning. So the walk-off mats aren't going to keep your building totally clean, but they certainly help to collect it at the door.

We want to make sure we want to use walk-off mats that can be exchanged and cleaned rather than use the primary carpet. It's going to stay dirty for way too long. Be careful about covering carpet with a rubber mat because you can trap moisture under there in a lot of climates, and that's just going to grow a mole farm and a bacteria farm.

So check under these mats for moisture, that's where a moisture meter comes in handy. Make sure we've got good moisture control. This hallway is pretty hard to keep clean and we know there are about two and a half kids in every classroom with asthma. We need to keep our buildings squeaky clean if we can.

So hard surfaces: keep everything so that custodians have a chance to keep it clean of particles. We look in the offices, work rooms, staff rooms – this is where we get the information. These people know what's going on, they hear the rumors, they hear things from the staff and the students about conditions in the building.

So this gives us a "heads up" of what to go look for. We look around for top and bottom. This is not going to be glamorous, but it needs to be done because you know – who's in charge of this refrigerator, maintenance staff don't want to do it and the teachers sometimes forget, it's a dirty job but it's something we need to look for for pollutants.

We look at these big photo copiers, these can produce ozone particles, VOCs, Volatile Organic Compounds. It's a good idea to have those vented or at least in a zone that's depressurized so air doesn't get out of that zone.

We see a lot of unvented laminators and these produce pollutants. These should be in a depressurized or downstream zone, added an exhaust fan. We look at storage, custodial, mechanical areas. Again, no stones goes unturned. We look for combustion products, make sure that range hood is working over these appliances so that carbon monoxide and odors and moisture don't get loose into the building.

We look at the custodial products and some of the equipment we provide with them. We don't want to be using industrial strength cleaners around students and staff, we want to use green cleaning products. The evidence these days is that four green cleaning products will do a good job on your building, top to bottom, so you don't need a full cabinet full of different chemicals. Four basic green cleaning products will be sufficient.

We look at the mechanical areas, we're not going to consider ourselves mechanical engineers or experts but we like to get a tour to find out what we think about this zone. We look for just observations; if you're going to go in some tunnels and so forth, you want to make sure you're protected against any contaminants that might be down there.

If there is asbestos you want to make sure you're properly outfitted; don't be going into zones that you don't know if there are any contaminants. We check for air flows in these combustion zones to make sure we don't have back tracking of these combustion appliances. These (fluids) and these atmospherically vented appliances; that's just a hole in the building. If we have negative pressure that's too excessive we can back track these and produce pollutants into the building, so we need to have carbon monoxide alarms where we have combustion appliances.

So you don't to need to be a mechanical engineer to look around for a carbon monoxide alarm. And that's a critical question, "Are we checking for combustion products with these alarms, day and night?" We look around for other signs. Here is official rat counter keeping track in the mechanical room.

So that's the clue that there are some issues in this building so we're going to need – we'll observe for traps and things and ask those questions, "Are we (sealing) up against these rodents and insects or are we just catching them once they get loose in the building?" We want to try and stop the entry to begin with we don't want to let these pests into the buildings.

So we will look for integrated pests management practices. We look around – you don't know unless you look – so we ask these people with the keys to take us every place and we just do common sense look around. Again, you don't have to be an expert to look around and find something that doesn't look quite right.

To me this doesn't look like really good practice. You don't have to be an expert to see gaps around these filters that are plugging up the coils so we're going to also impact energy efficiency and comfort by plugging up these coils

with debris and also this dirt on the coils could get wet and be contaminated with mold and bacteria.

We're looking for common good sense practices; if this drip pan underneath this air-conditioning unit is full of slime, I would suggest that's not practical and so you don't need an expert to know when something doesn't look right.

Disconnected linkage: we know that system is properly not working properly so we just look for the practical stuff. Mold is an issue and we want to make sure we don't have a wet building because if you have moisture you're going to get mold. That's your recipe for a mold problem, so look for moisture and molds.

If something is going to get wet make sure it's not mold food. We have water in our buildings, we have showers and toilets and sinks and kitchens but we don't make those environments out of mold foods. So get the mold food away from water. If you can't solve a leak, at least get the mold food away, don't store mold food where you are going to have potential for water.

Don't vent the moisture inside; we're hoping this isn't a gas dryer. It is not a good idea to put moisture in the building on purpose, so vent those to the outside. Not only are you getting particles but you're getting moisture and other contaminants, using a thermal imager you can find moisture problems that aren't visible to the naked eye. So while these cost a little bit of money they can really save you time and document problems.

Look at the equipment and the techniques that the custodians are using, some of these technology here is about 10,000 years old or more. I will suggest it's probably not proper in this day and age to just rearrange particles with some of this poor equipment. We need to provide our custodians with good equipment, the proper training, and the proper resources to do a good job of cleaning our building.

So while they might use a terry cloth towel like this to clean up particles, they're going to work a lot smarter, and it's going to be a lot easier and more effective if we use some of the new products like micro fiber products as opposed to a feather duster that just rearranges the particles, just stirs them up.

Carpets can hold huge amounts of allergens and asthma triggers – we don't get all these out when we extract or vacuum so we need to be careful about how much carpet we put into our schools and perhaps avoid carpets if we don't have the resources to properly maintain them. There are serious exposure risks associated with older carpets that have seen their useful life; we see trip and fall hazards and so forth.

So carpets need to be maintained properly or basically removed. We also see carpets that have been loved to death, you might say. Chemicals have been used over the years, the chemicals doesn't get all removed when you extract, so there could be what we call second hand suds. These detergent residues dry and they flake off and people are exposed to these detergents, causing eye, nose and throat, skin problems.

So it may be something as simple as just a contaminated carpet with cleaning compounds that are causing the problems in the building. We look at our vacuums with a particle counter to see if these vacuums are spitting out more particles than they are collecting. In our experiences, a lot of these vacuums don't capture as many particles as the manufacturer or the user might suspect. So you'd want to make sure you use a filtered bag and you also need to consider whether you need to replace that carpet.

A lot of our carpets in buildings are way past their useful life; they're actually a contaminant in the building, but we know that replacement is more than just a cost of a new carpet. Sometimes these carpets have been glued down to asbestos, tiles, or there is asbestos in the glues and it's not trivial in terms of time and money to replace these carpets, but it needs to get on the radar screen so people can start thinking about how to get rid of these contaminants.

We make sure the exhaust fans are working for our locker rooms, rest rooms, custodial cabinets, and other places where we know there's known contaminants. So we just use our smoke tool to check the pressures in that room to make sure air is going clean to dirty.

Now the classrooms people have been breathing in air until say 10.30 in the morning. Now we can go look for CO2. So we check: first thing we do when

we walk in is size up the room. Can that room be cleaned? Ventilation is good, but it's not going to control all these contaminants.

We look to see how tidy the room is, make sure that the custodians are able to clean that room. We can get the students to help if custodians are strapped for time off. Oftentimes they get three or four or five minutes in a classroom and if they spend the first five stacking furniture, they're not going to get much accomplished with vacuuming.

So at the end of the day we can get the students to help make sure that the custodians have the time to do the job properly. Perhaps on Monday they put the chairs on the left hand side and on Tuesday they put it on the right hand side and allow that custodian to make the best use of their time. So they are working smarter and not harder.

You want to evaluate cleaning. I will suggest this room is not clean enough, it doesn't take a rocket expert to see that these rooms may need some better custodian. Now whether it's time or money or equipment I think we need to stress the fact that buildings need to be clean. Filters don't clean the building. We don't want maintenance people or operations staff to say, "Well we've got good filters, so we can ignore the space." Filters are just an added attraction, so we don't want to rely on our filters to clean the building, we need good custodial services.

Asthma triggers, we look around for excessive use of contaminants. In this classroom every student had one of these white board markers open and the ventilation simply isn't going to handle this strong pollutant. These are not air cleaners, these are actually just masking when we use so called deodorizers. You're just adding more contaminant to the space on purpose.

So we want to avoid this, we want to use good cleaning and adequate ventilation with the exhaust and you don't need these things if you've got a clean building. These can also be fire hazards, they can't have lit candles so they put them on a hot plate.

Some of these other chemicals in (weeds) and so forth, we want to avoid these chemicals; we want to make sure we don't bring in furniture from home or

pillows or blanket that we've had as an unknown history. These could have dust mites and pollens and pesticides and cat dander and other allergens on these.

So when a student pops on there, they're exposed to an A-bomb of potential asthma triggers or allergens. Just because something is free doesn't mean it belongs in the school, so what's outside tends to get inside. So we should restrict everything in the building to whatever is supplied by the district.

Get rid of the fleecy stuff, think about finding a new home for the animals, it's OK for him to visit the school for a day or two perhaps as long as those students with allergies and asthma are cautioned not to get too close to avoid exposures. They shouldn't be living in the classroom, we talk to the teachers about any concerns they have from comfort or cleanliness or contaminants or odors and whether they sense the fresh air or not.

Look around if they have an air cleaner; we need to ask why: "Why do you need that air cleaner?" And it may be a good response to a problem. We also check to make sure those are effective; some of these air cleaners aren't really doing the job, they're just using electricity, so use our particle counter to make sure what's coming out is indeed been cleaned.

We definitely avoid the use of ozone generators; if you find these in the buildings they need to go away. Absolutely don't allow those into your schools. We look for chemicals, we look for other pollutants in the space, we look high and low, we send those chemical home that aren't district-supplied.

Any chemicals in the building have to have an MSDS sheet associated with them and people need to be properly trained on using them. So it's not a free-for-all with these – with this basic chemistry set underneath the sink.

We want to make sure we are using integrated pest management, which you'll find at EPA, which is a much better way to control pests than using poisons. Look for other chemicals and problems in the building that might be left over. we need careful disposal of some of these items. We ask questions with the staff, "What do you know about your space?"

We look in some of the spaces that may not be obvious and you never know what you're going to find in there, so look high and low, don't just breeze through the building, take a look around and look for any potential problems. We build our building out of mold food, we need to keep these products and these materials dry.

Vinyl wall paper can hide a mold problem so we look for condensation. We look for cold spots, wet spots. Again the moisture meter and the thermal imagers is going to help you, when you see dehumidifiers you have to ask why, and we find out that's a zone underneath against the back wall of an underground building and turns out that those wall cavities were full of mold.

So be careful, just use common sense, if it's underground it may have a moisture problem. The evidence of mold may not be obvious, sometimes if we suspect molds, what you need to do is conduct a visual inspection and sometimes that means cutting a hole in the wall, which may not be a big deal.

We cover these little inspection holes with the basic blank switch plate, you know they cost less than a dollar. So it's an easy way to patch an inspection hole but now you've looked and you can discover some things.

We check for damp carpet under a chair mat. If you've got concrete floors that concrete can wet moisture, it can be trapped underneath these plastic chair mats and cause a problem. So we measure that with a moisture meter and often times we find here is a bulls eye on this chair mat suggest we've got mold and bacteria and so forth underneath these chair mats which can cause problems.

We look above T-bar ceilings or these tile ceilings, so we look high, we look low. If there's a fiber glass up there, you can imagine the – all the openings in these tile ceilings where those particles did drip down and expose to people below. Fiber glass is a strong irritant; we want to maintain the air barriers so these particles don't get down to the occupied zone.

So exposed fiber glass is not a good thing in our buildings. Gravity always wins so we want to make sure whatever is above those ceilings is contained. There is evidence of fiber glass coming down into the occupied zone next to

the coat rack, not a good situation. We measure the CO2 and we measure what's coming in, if the CO2 coming in is the same as the room it suggests we are not getting any fresh air.

So we measure what's in the room, we measure what's coming in and again we wanted to have to have about 1,000 parts per million or less, you can see the air coming into this classroom was elevated. So we're not going to get that classroom down below 1,000 if it's 2,500 coming in. We check for the fresh air intakes.

We look to make sure the teachers or the buildings people haven't covered out vents that restrict the air flow. Not much air flow coming into that unit. We want to make sure they don't cover the vents, so putting up a sign like this might help; we do have middle schoolers. So we need to make sure that people don't cover our vents and we give the staff proper training so they don't turn off the systems and reduce the fresh air.

If that's a noisy system, we need to fix the noise. This teacher has covered up one of the vents in their classroom so there could be a difference in those two rooms. We're going to check the air filter while we are in the room. Obviously this is a self-correcting filter that's been ignored by the maintenance people.

So take a quick look at the filters while you're there, see if they're working properly, see if they're catching the particles and they are plugged in and changed on a routine basis. Underneath this ventilation system, we find a tunnel. It goes down to the boiler room and so this is one of those unplanned pathways that can distribute pollutants right into the air handler and that's creating some exposure.

Here is a message from the occupants, obviously whoever is running this room had to take things in their own hands. Computer classrooms can be overheated because they weren't designed for computers so we need to check temperatures for comfort and productivity. Here's another message from the occupants that something is wrong so we need to check in and ask questions, "Why is this happening," and "What can we do to solve this issue?" Pieces of cardboard are not a solution.

A system seems to be slowing down, and we can't explain why.

Here we go and here is another message from the occupants. Again we don't want to just rip this down and admonish the people for messing with the system, we want to find out what's the deal here and come up with an agreeable solution.

A good suggestion is to have a non-threatening way for people to voice their concerns or their issues so it is documented and we get action. We want to make sure we are using green cleaning products, we don't want to use a lot of industrial strength cleaners in the buildings. We look for these airflows in critical zones, shops, gyms, science and art labs, to make sure they're using these caption and exhaust hoods properly.

We want to makes sure that the exhaust is working 24/7. We want to contain and exhaust any known contaminants. This home economics department had a hood but it doesn't vent anywhere except into the room, so that might be something to put on your to do list, make sure kilns and other contaminants could be exhausted to the outside and they're working properly. So exhausters are really good.

"Fix it now" examples: why wait? Let's fix it while we're there. Here is a carpeted room with a floor drain. Now that floor drain can dry out and let sewer gas in, so we check, it's dry as a bone, actually got spiders living in it, so we add water and we put little mineral oil in there to retard evaporation. So we fix that in about one minute.

We can take those and discuss with the teachers the fact that we need to move that sign over so it doesn't cover the vents, we can talk to the teacher about moving these off from the ventilation system, we can move those boxes and find a better spot for them, we check the thermostats to make sure that they are not set on automatic which shuts off the outside air when the room is comfortable. So we need to make sure we're running those systems while the rooms are occupied.

We can check the time clock while we're in there and readjust those. Check for filters again; this one looks abandoned. Check the intakes, real quick, just

take a screw driver, open those up, clean them out, you're back in business. So we fix things while we're there. Here we found these papers plugging up a system; we cleaned it up in just a few minutes, now the CO2 is down below 1,000. So fix it while you are there. We can open up the outside air dampers. Get the mechanical people to fix that system.

We were in the attic of this school, we found a high CO2 level and simply dialed it in for more fresh air; now the school is down below 1,000. Get rid of these things if we can, phase them out; some things will take a few more minutes than just five or six so we can fix it tomorrow but it needs to get on our list of things to do. We want to block these pathways, make sure that air doesn't get loose into this building for cross contamination, seal off the ducts, it might take some (mastic) but we need to deal with these air leaks, these unplanned pathways.

Teachers running their system but the loose fan belt, we're not getting that full airflow so we need to get a wrench and tighten up those fan belts and perhaps change them while we're at it. Get rid of these contaminated materials. It looks like that board can be removed pretty easily and disposed of properly. We want to make sure the filters fit correctly and the mechanical system is tuned up so that those filters don't get loose.

We might need a little more time and money for some of our fixes, might need a new exhaust fan. I need to add a fan if there isn't one in this older school. We want to make sure we adopt some green cleaning; we might need better vacuums, maybe better auto scrubbers and better equipment to supply those custodians.

They cover these outdoor intakes during the winter, during cold snags to protect the systems from freezing, rather than keep them covered all year, they install these brackets so they can drop a (blockage) in there just temporary a day or two until that type of blizzard passes. So don't leave things covered all year; make a system.

Getting rid of animals might be a cultural change; people get attached to these critters and you might need to just give people an advance warning that, you

know say next school year we're not going to have these so they can find a proper home for the pets. Get rid of non-district furniture; institute a policy that says, you know starting next fall, we're not going to do this.

So it gives people a chance to find a place for Aunt Agnes' old sofa that they might be attached to. Put in some exhaust hoods over our contaminating materials and equipment; get that duct work on there and make sure the exhaust fan is working. Ventilate that crawl space so that the air doesn't go into the school as it's exhausted out and actually school air is being drawn down into this zone of clean to dirty.

Seal up unplanned openings, get rid of fiber glass. It could be exposed, if you have older equipment that won't meet these current CFM, cubic feet per minute standards of fresh air, do the best you can. It may not be perfect but don't just throw up your hands and say, "It's an old system," see what you can do to tune that up and make sure it's going to work to the best of its ability. So I'm going to turn it back over to Dave to talk about communications when we are finished with walkthrough.

Dave Blake: Thanks Rich. So when you're done with the walkthrough, you want to sit down, if you have a chance, with the principal and the team and discuss your findings for the day. During this debrief, you want to summarize the findings, talk about the good and the not so good, but definitely emphasize any immediate risks, if there have been any, and get some assurances that those are going to be dealt with in a timely manner.

But the typical things that come up in these post-walkthrough discussions are hardly dramatic, they're basics things like "fight moisture." And send the chemicals home that we identified and noted classroom-by-classroom, control the pollutants you've made people aware of. And again these are our recommendations following a walkthrough, typical recommendations.

Improve shop and art exhaust, a very common problem. You can see the clay dusts suspended in the air and those sunbeam coming into the art room. Typically, problems with trying to maintain carpets to manufacturers

specifications, it's just like a budget: you want to ditch those old couches and send them home.

And definitely take all of the results again and post them in the staff room with business cards of people that can answer any questions so that little Tommy doesn't go home and announce that his classroom was 1,000 parts per million carbon monoxide, for example, instead of carbon dioxide. That can kind of raise the eyebrows of the parents.

We'll recommend that you take the good things that we found and build a plan. You have a fledgling program, just kind of adding this good stuff you're doing already. This excellent filter changed our records that this school had going.

We want to encourage doing routine assessments; we did it today but let's come back and do it again and make sure things are still humming along as time and the budget allows. Try to get the students involved. We've had an excellent student helper here who now is off in college and getting her health degree.

Communicate: this school posted all the good stuff they've done about indoor air chronologically in the staff room just to keep people abreast with what's happening for progress. Communicate outside the school, too; if you're doing a good job at your school, publicize your efforts, you know you have an indoor air quality program. You get that in the papers then, say, down the road, you have an issue, a little crisis. When the article comes from the paper, they're going to lead off with the fact that you've not been asleep at the wheel, you've had a proactive program and this thing just happened. View EPA's IAQ Tools for Schools Communications Guide at the following link: http://www.epa.gov/iaq/schools/pdfs/publications/communicationsguide.pdf.

We like to give out certificates that the schools can hang in their lobby; it's not saying that it's a perfect school but it's saying that they care and they're in the process of trying to keep things as good as possible. We have produced our newsletter which is still on our website, Rich's website, and basically everything we know went into these newsletters. We ran out of stuff to say so

we stopped doing the newsletter but they're all on Rich's website and you're welcomed to take any of those articles and use them for your very own.

Rich Prill: About 10 years worth.

Jennifer Lemon: OK, thank you so much Dave and Rich. I think that was a thorough, thorough assessment of how to do a walkthrough through the school. And as we wrap up we're going to get our question and answer segment, so just as a reminder, if you have any questions go ahead and type them in the instant message pane and we will address them as they come in.

Lastly before we get started with the questions and answers, I would like to do another polling question please just to get an idea if this was helpful information. If you could answer the question, "After hearing this presentation, do you feel more confident, prepared to perform a comprehensive IAQ walkthrough?" So the polls are open, and I do actually feel great to see that that no one has clicked no.

But I respect the fact that it is a lot of information that Dave and Rich – Oh someone just had to click no, just to be funny. Great, well thank you, we appreciate that, we just want to get a little clarity around the information that was presented, because we do recognize that it is a lot but I think Dave and Rich do a great job especially with all the pictures depicting a real world sense of what goes into assessing a school from literally top to bottom.

So thank you for that, and real quickly I just want to close it off with a couple of resources and reminders and then we'll go back to the question. So perhaps some of you who participate in our outreach and communications received an email recently that we have revised the tools for schools website.

I encourage you to go there, learn about our upcoming events and our up-to-date programmatic information. One of the newest features you might have heard of on our website is the interactive Tools for Schools kit. So the boxed kit that we have that the picture was shown in the beginning of this presentation is something you can actually maneuver through by clicking on tabs on the website now, and right then and there if there is information or the

checklist that you want to have for your usage, you can download a PDF or Word version which you can tailor to your schools to use for a walkthrough.

So I really encourage you guys to visit the website, look around, there's an opportunity to connect with other school districts and get a mentor as you work through the components of an IAQ management program and getting that executed in your school as well. View's EPA's IAQ Tools for Schools Champions to help identify mentors at the following link: http://www.epa.gov/iaq/schools/nationalmap.html.

Couple of other resources for you to stay connected with us: I'd mentioned the E-newsletters and emails that provide information about upcoming events and products that we've developed, you can log on and send an email to the website listed there, the Cadmus Group website, and we'll get you on that list so you can stay connected with us.

We do have an email discussion which is what we refer to as our list serve, and that is also something that we use for you guys, the peers, where you guys can connect with your peers, ask questions.

There is an anonymous ability to do that so if you have a very specific question and don't want to call out your school, that says there is a mold problem, we have the ability to still post that question and for you to get feedback from other districts who have dealt with issues like that and see how they have managed that and perhaps even what types of products and vendors they have used to address that.

Another place, which is where you're going to be getting the web conference information, is the website listed lastly about the web conferences. That's where the archives of other technical websites and webinars are housed and also where this one will show up as well. View EPA's IAQ Tools for Schools web conference page at the following link: http://www.epa.gov/iaq/schools/webconferences.html.

So lastly, there are a couple of areas where Dave and Rich have indicated some resources that they recommend as well. Dave said there are some great opportunities to log on to their website, energy.wsu.edu, where you can get

some publications, like he said, over 10 years past and also see there's another place, nwcleanair.org, where you can download and watch the videos.

Next and lastly, just a couple of reminders, we will have a brief evaluation that comes out, and we'd really appreciate your feedback to make sure that we're addressing your needs and giving you the best information possible. So we appreciate it if you could respond to that when it does comes up. It's just a quick little survey and will take no more than five minutes.

Also there will be a follow-up email for people that have participated in this webinar, that will include a link to the slides that are PDFed and you will be able to view a sync audio presentation, so again this is something you can pass on to your colleagues to use in a future training, that the whole webinar you just sat through could be presented to individuals that weren't able to attend.

So please look for that email, letting you know that that's come out and as always we are definitely open for feedback and questions or suggestion for topics that you would like to see covered or information that you would like to see in the upcoming technical webinar.

So right now we're going to go ahead and address the questions that have come in. We will try to answer as many as possible; we are definitely respectful of everybody's time so we will see how many we can get through but other questions that are not addressed, we will have in a comprehensive question and answer document that will be a summary with the answers and that would be included on our website and well.

OK, a couple of questions that we have, Dave and Rich, I'm going to go ahead and read them out loud and then pass it on to you guys to see if you can provide answers. So the first question is, "How often should CO2 numbers be tested?"

Dave Blake: I think pretty frequently to begin with, so you can see how reliable your mechanical systems are. We see schools with 50 heat pumps on the roof and at any given day one of those may not be working properly, so it depends on the reliability of the system. So I will check them frequently, maybe once every couple of weeks, just to see how things are going and if you don't find

any problems then stretch those out to, say, once a month to once every six weeks. But again, getting a student to do that is kind of a nice way to go.

Jennifer Lemon: OK, the next question is, "Is there a test for mold that you don't need a kit to do?"

Rich Prill: Evidence suggests that doing a visual inspection is more reliable than a mold test of some sort, but probably one way you can do that yourself is using a tape sample which is basically cellophane tape; you find some settled particles, you collect those on a sticky tape and send that to an expert and they can tell you what's been floating around in that space over time.

And if they find a lot of molds spores and things, then you might have a mold problem; but again, looking for moisture sources and for signs of moisture is often times the best way to go, because you don't always find mold floating round. It could be contained in a wall cavity or something, so visual inspection is the first step in looking for a potential moisture sources.

Dave Blake: If you can see it or smell it, you've got it. We will be talking in another webinar in January about some sampling and investigations, sort of the next step to the walkthroughs. What do you do in terms of measurements and sampling? So people can tune into that, we will be talking about more of these techniques.

Jennifer Lemon: That was a great plug, thank you Dave for doing that. Another thing that I meant to mention was that we're going to kind of refer to the webinar that Dave just spoke about as a "201" follow-up to this presentation, and it will be held on January 26th. So please look for information about registering in advance for that.

Another question is I think this will be a really quick one: somebody was asking, "What is mold food?" Could you give a definition of that guys?

Rich Prill: Essentially cellulose and wood products, paper products and wood products are the biggest. So that includes everything from ceiling tiles, dry wall, particles, organic particles in carpets, organic materials that mold can eat to survive.

Jennifer Lemon: OK, great. Here is a radon question. So you did mention radon as part of the walkthrough process, do you use an instantaneous device or do you leave a device or the test kit there for three-to-five days?

Rich Prill: Instantaneous devices are expensive and so using canisters or short term tests is a good first step. We call those screening tests so you leave them out for five or five days or so. And that gives you an idea of whether you've got a problem or not. And then you can go to a longer term test that gives you a better idea of long term exposure, which is what the risks are based on.

So you don't want to wait a long time to get your results if you've got a problem, so we recommend a two stage process: a short term test to see what you are breathing, and then, if you don't have a big problem, a longer term test to ensure that you don't have exposure.

David Blake: And we don't typically do that test ourselves, we just recommend a school district follow up and do it for itself.

Rich Prill: Radon is for (inaudible) measurement to make, so it's still a big problem across the United States, so the more we learn about radon, the more we're finding that there are places that in the past we didn't believe had problems and we are finding these hot spots the more we do measurements, so everybody should measure, even if you're in one of those counties or zones with a low potential.

Jennifer Lemon: Great guys, thanks for that. Another question is, "What guidance do you use in interpreting particle counter results?"

Rich Prill: We've been collecting particle counts for about 10 years and so we compare it to our database; there are no realistic standards, so we compare outside to inside and we compare sort of non-problem zones to problem zones. We also just track it over time, so we see if our filters are efficient, there are no bypasses, and we look for particle sources, if we are finding high particles in one zone and not another, we look to see if there is a source that we can control.

So it's a little more of an elaborate measurement that most people wouldn't typically use but if you can afford to have a particle counter, we find it to be quite useful.

Dave Blake: In general I've been taught that you want to have less than half the level inside than outside typically. IfI inside, the particles are the small particles or less than half of outside, your HVAC system is pretty much doing what you want it to do.

Rich Prill: The other nice thing about a particle counter is you can kind of assess your carpet and your upholstered furniture so that it might promote better cleaning or actual removal of some contaminated pleated materials.

Jennifer Lemon: Great, OK, we have one about PCBs concerning buildings especially around the window cork. Do you have any recommendations for addressing this during a walkthrough?

Rich Prill: Well that's getting a little more exotic measurements, some of these measurements are difficult to do. If you suspect you've got a contaminant, whether it's from (inaudible) or PCBs or mercury in a product or asbestos or lead, you need to check with your local authorities for experts so that you take a sample carefully and realistically and get that analyzed by a certified lab. So this is not a do-it-yourself thing.

Jennifer Lemon: I knew that was somewhat of a controversial question. Now someone is asking how would or who would they contact to have assistance in a walkthrough for the Northeast area?

Rich Prill: Well, there're a lot of our colleagues that are based in the Northeast and you are welcome to call us or email us individually and we could suggest this or that colleague who in turn could suggest someone else that might help you up there. Otherwise we are happy to give advice and counsel from long distance for anyone that wants to call and talk about a walkthrough.

If they have questions on it, we're happy to answer any questions. We are part of EPA's network of mentors on this topic and we are happy to go to work for any of you people.

Some of the state agencies have been doing a good job with walkthrough; one state in particular is Connecticut, I think they've tried to visit almost all their school districts, so check in with your neighboring states or your own state, health department or school agencies and find out who might have some experiences and resources available to help you out.

So it might take a little bit of homework but having a mentor is a good way to get started for the first few walkthroughs. That's what Dave and I tend to do as we might go to a school district that has 23 buildings but we only walk through four or five of those and then perhaps loan them the equipment. So we provide the training and turn it over to them. This is a long-term-skills-training thing. View's EPA's IAQ Tools for Schools Champions to help identify mentors at the following link: http://www.epa.gov/iaq/schools/nationalmap.html.

Jennifer Lemon: Actually that was a great plug for the mentor component on the website, there is a new part of the website where you can scroll down and look at the finder state and see programs and school districts who have won a national award within the past 10 years, and they will be great to connect with, as far as doing the walkthrough assessment and just gaining knowledge on how they incorporated this process into their IAQ management planning.

So I think we can take one more question and then we want to be respectful of everybody's time, so the last question would be this: Dave and Rich, you talked about four green chemicals that people can use. Can you list those chemicals please?

Dave Blake: I sure can't, Rich?

Rich Prill: No. You'd have to check with your big vendors and you'd want to look for those products that are green seal approved, you know there is quite a bit of kind of overuse of the word green these days, you know everything is green. So you'd want to look for third party sort of certification and Green Seal is a third party that does a good job of checking out these products.

But the school will need to do a little homework on that, they want to phase out what they're using, you wouldn't necessarily want to dump all of the products that you have in-house but start phasing in some of these more approved things. There is the Green Cleaning Institute that you can look at, the Healthy Building Institute; they can help you with some of this product selection.

Jennifer Lemon: OK great, we will. Again, thanks everybody for your time, we really appreciate it especially on a Friday, when we know things are winding down, hopefully. I really hope you can attend our next webinar; that would be in January 26th, so please look for our communication about that and register for that as well.

Dave and Rich will be presenting the 201 version in this webinar and again, you will find information about the slides and follow up information and questions that we didn't get a chance to answer on our website as well. So be looking for those communications.

Thanks everybody, and thanks again to Dave and Rich for taking the time to participate in this webinar and we look forward to connecting with you again. Have a great weekend everybody. Bye, bye.